

How does the Sun and its magnetic field control the environment of the solar system?								
Exploration Contribution	Science Questions	RFA 2003	Objectives / Investigations	Measurements	Observed Region	Spacecraft Location	New Instruments	Technology Development
Improve SEP Predictions	How and where are high energy particles accelerated?	2b	Understand the acceleration of energetic particles associated with flares, CMEs and shocks.	Magnetic fields and topology	Photosphere	Earth		
					Chromosphere	Earth	IRVM	Large arrays, deep well CCDs
					TR-Corona	Earth	UVM	Prototype in development
				Image energetic particles and effects on solar atmosphere	Extended Corona	Earth	IRVM	Large arrays, deep well CCDs
						Earth	LA/UVCS, LA/VLC	
					Inner Heliosphere		GI	RHESSI
					Flare site, Current sheet, CME Shock	Earth	XRIS	large array sizes; small pixel sizes; High count rates
		2b	Understand the acceleration of energetic particles and shocks throughout the heliosphere.	Energetic particles	Flare site	Earth	HXIS	large array sizes; small pixel sizes; hard x-ray focusing optics; High count rates
					Inner Heliosphere		NL GR	RHESSI
					Inner Heliosphere		Particle	
				Plasma parameters	Flare site, Current sheet, CME Shock	Earth, inner heliosphere	Particle, LA/UVCS, LA/VLC	
					Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
				Plasma distributions, compositions and charge state	Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
				Flow field, mass flux	Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
				Magnetic fields and waves	Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
					Heliosphere	Heliosphere	Particle	
				Radio Emissions	Heliosphere	Heliosphere	Radio	
					Heliosphere	Heliosphere	Radio	
					Heliosphere	Heliosphere	Radio	
	What are the physical processes the control the production of flares and CMEs, the primary source of solar energetic particles?	1a	Understand the emergence of magnetic flux through the photosphere, Chromosphere, TR, and into the corona.	Vector magnetic field measurements.	Photosphere	Earth		
					Chromosphere	Earth	IRVM	Large arrays, deep well CCDs
					TR-Corona	Earth	UVM	Prototype in development
				Thermodynamic structure	Photosphere	Earth	IRVM	Large arrays, deep well CCDs
					Chromosphere	Earth	HTUVS	Gratings, active pixel sensors
					Transition Region	Earth	HTUVS	Gratings, active pixel sensors
				Velocity structure	Corona	Earth	HRNBI	Image stabilization
					Corona	Earth	HTEUVS	Gratings, active pixel sensors
					Corona	Earth	HTEUVS	Gratings, active pixel sensors
		2a	Understand the build up and release of magnetic energy in flares and CMEs	Magnetic fields and topology	Photosphere	Earth	HRNBI	Image stabilization
					Chromosphere	Earth	HTUVS	Gratings, active pixel sensors
					Transition Region	Earth	HTUVS	Gratings, active pixel sensors
				Thermodynamic structure	Corona, Current Sheet, CME Shock	Earth	HTEUVS, HRNBI, XRIS, XHRIS, LA/UVCS, LA/VLC	Gratings, active pixel sensors; Image stabilization; large array sizes; small pixel size; X-ray Optics
					Chromosphere	Earth	HTUVS	Gratings, active pixel sensors
					Transition Region	Earth	HTUVS	Gratings, active pixel sensors
				Velocity structure	Corona, Current Sheet, CME Shock	Earth	HTEUVS, XHRIS, LA/UVCS, LA/VLC	Gratings, active pixel sensors; x-ray optics and detectors
					Photospheric magnetic field motions.	Photosphere	Earth, Ground	
				Energy release	Corona, Current Sheet, CME Shock	Earth, inner heliosphere	XRIS, HXIS, GI, XHRIS, LA/UVCS, LA/VLC	large array sizes; small pixel sizes; High count rates; hard x-ray focusing optics;
					Energetic particles	Corona	Inner Heliosphere	RHESSI
				Magnetic fields and topology	Photosphere	Earth, Ground, Polar	UVM, IRVM	Large arrays, deep well CCDs
					Chromosphere	Earth, Polar	UVM, IRVM	Large arrays, deep well CCDs
					TR-Corona	Earth, Polar	UVM, IRVM	Large arrays, deep well CCDs
		1b	Understand the generation of the 3-D solar wind.	Plasma parameters	Chromosphere	Earth, Polar	HTUVS, HRNBI	Gratings, active pixel sensors; Image stabilization
					Transition Region	Earth, Polar	HTUVS, HTEUVS, HRNBI	Gratings, active pixel sensors; Image stabilization
					Coronal base to 10 R_sun	Earth, Polar	HTUVS, HRNBI, LA/UVCS, LA/VLC	Gratings, active pixel sensors; Image stabilization
				Plasma distributions, compositions and charge state	Coronal base to 10 R_sun	Earth, Polar	HTUVS, HTEUVS, LA/UVCS, LA/VLC	Gratings, active pixel sensors
					Flow field, mass flux	Coronal base to 10 R_sun	HTUVS, HTEUVS, LA/UVCS, LA/VLC	Gratings, active pixel sensors
					Vector magnetic field measurements.	Heliosphere	0.3-5AU in and out of ecliptic	
				Plasma distributions, compositions and charge state	Heliosphere	0.3-5AU in and out of ecliptic		
					Plasma Waves/Radio	Heliosphere	0.3-5AU in and out of ecliptic	
		1c	Understand the propagation of the 3-D solar wind.	Solar wind EUV emission	In situ Boundary Region	1-4AU, in and out of ecliptic	DEUS	low intrinsic noise MCPs; diffraction gratings
					Flow field, mass flux	Heliosphere	0.3-5AU in and out of ecliptic	
					Energetic particles	Heliosphere	0.3-5AU in and out of ecliptic	
				Plasma parameters	Heliosphere	0.3-5AU in and out of ecliptic		
					Plasma distributions, compositions and charge state	Heliosphere	0.3-5AU in and out of ecliptic	
					Flow field, mass flux	Heliosphere	0.3-5AU in and out of ecliptic	
					Magnetic fields and waves	Heliosphere	0.3-5AU in and out of ecliptic	
					Radio Emissions	Heliosphere	0.3-5AU in and out of ecliptic	
	How does the solar wind/magnetosphere interaction accelerate high energy particles?	3b	Understand the propagation of energetic particles and shocks throughout the heliosphere.	Energetic particles	Heliosphere	0.3-5AU in and out of ecliptic		
					Plasma parameters	Heliosphere	0.3-5AU in and out of ecliptic	
					Plasma distributions, compositions and charge state	Heliosphere	0.3-5AU in and out of ecliptic	
				Flow field, mass flux	Heliosphere	0.3-5AU in and out of ecliptic		
					Magnetic fields and waves	Heliosphere	0.3-5AU in and out of ecliptic	
					Radio Emissions	Heliosphere	0.3-5AU in and out of ecliptic	
					Radio Emissions	Heliosphere	0.3-5AU in and out of ecliptic	